FW: BOS 10/18 - Hitachi Zosen Inova Appeal

Annette Ramirez

Wed 10/12/2016 4:37 PM

To:cr_board_clerk Clerk Recorder <cr_board_clerk@co.slo.ca.us>;

5 attachments (1 MB)

2000-09.EPA Odor Control in Biosolids Management.pdf; 2016_10_11 ADP Traffic Engineer's Peer Review Letter.pdf; 2016-10-07 Acoustical Response to Appeal Letter.pdf; 2016-10-10.Air Quality Responses to Appeal Letter.pdf; 2016-10-11.HZI AD Facility DRAFT OIMP v1.pdf;

From: Lisa Howe
Sent: Wednesday, October 12, 2016 4:26 PM
To: BOS_Legislative Assistants <BOS_Legislative-Assistants@co.slo.ca.us>; Annette Ramirez <aramirez@co.slo.ca.us>
Subject: Fw: BOS 10/18 - Hitachi Zosen Inova Appeal

Correspondence for the October 18th agenda - Item #24 (Hitachi Appeal)

Lisa Howe
Administrative Analyst
County of San Luis Obispo

Connect with us:
www.facebook.com/SLOCountyGov
www.twitter.com/SLO_CountyGov
www.linkedin.com/company/county-of-san-luis-obispo
www.youtube.com/user/slocountygov

From: Brandi Cummings
Sent: Wednesday, October 12, 2016 4:02 PM
To: Lisa Howe
Subject: BOS 10/18 - Hitachi Zosen Inova Appeal

Hi Lisa,

The applicant for this project has provided the following additional documents to go along with the appeal. Could you please post with the staff report online and forward to the Supervisors please?

Thanks,

Brandi Cummings
Planner II
Department of Planning & Building
County of San Luis Obispo

United States Environmental Protection Agency | Office of Water Washington, D.C. | EPA 832-F-00-067 September 2000

EPA

Biosolids and Residuals Management Fact Sheet

Odor Control in Biosolids Management

DESCRIPTION

This Fact Sheet provides information on the control of odors from biosolids production facilities, and the prevention of odors from the storage, distribution, and application of the biosolids product. The level of detail is intended to provide an overview for decision-makers including wastewater treatment plant managers and authority managers. The information provided is not intended to be design guidance.

Nuisance odors are a common occurrence at wastewater treatment plants, biosolids processing facilities, and biosolids recycling locations where proper management and control are not implemented. Failure to acknowledge the potential for odors and to work to prevent odor emissions can result in complaints, shutdowns, expensive retrofits, and non-acceptance of the finished product. Every operation should keep a systematic record of odor complaints.(Chlupsa) Proper facility design, operation, management, control and careful oversight are necessary to minimize odors. Water quality professionals have a responsibility to mitigate nuisance odors.

The most successful odor control programs are those that take a holistic approach and examine the complete system from sewer users to land application practices. Just as a good physician can identify the cause of the illness and not just treat the symptoms, effective odor management will identify and manage the source of odors and not just attempt to mask or hide the offensive odors. In addition, a holistic approach will encompass effective communications with those groups that may be negatively impacted by odors.

Nuisance odors can have detrimental effects on aesthetics, property values, and the quality of life in communities subjected to them. There are odorous compounds that are classified as toxic pollutants, but emissions of these compounds are restricted by air quality regulations and their control is not part of this discussion. An odorous biosolids product, or a biosolids treatment process that results in odor emissions, may be perceived as unhealthy due to the origin of the solids. The cause of health complaints in the absence if irritation or toxicity is poorly understood. (Schiffman et, al.) Tangential information is available from other industries but there is no necessarily direct relevance to biosolids odors. More research is needed to identify potential health effects of biosolids odors.

Odor complaints at operating facilities can lead to long term problems. Local public opposition can delay or prevent expansions or upgrades to facilities required to improve water quality. The anticipation of nuisance odors from proposed land application programs can limit the implementation of a worthwhile beneficial reuse program.

Why Do Biosolids Generate Odors?

The beauty of biosolids is that is an abundant source of food for microorganisms including protiens amino acids and carbohydrates. These beasts in biosolids degrade these energy sources and odorous compounds are formed. (Walker, 1991) Organic and inorganic forms of sulfur, mercaptans, ammonia, amines, and organic fatty acids are identified as the most offensive odor causing compounds associated with biosolids production. These compounds typically are released from the biosolids by heat, aeration and digestion. The odors vary by the type of residual solids processed and the method of processing.

Anaerobic digestion of primary wastewater residuals produces hydrogen sulfide and other sulfur-containing gases, while alkaline stabilization of the solids volatilizes ammonia along with other volatile compounds. Composting odors can be caused by (Walker) ammonia, amine, sulfur-based compounds, fatty acids, aromatics and hydrocarbons such as terpenes from the wood products used as bulking agents. Aerobically digested and air-dried biosolids may contain little hydrogen sulfide, but have mercaptan and dimethyl sulfide odors.(Bertucci, Dodd, Hatfield, Williams)

The five independent factors that are required for the complete odor assessment are:

1. Intensity or pervasiveness- a measure of the perceived strength of the odor compared to concentrations of a standard compound.

2. Character - which relates to the mental association made by the subject in sensing the odor.

3. Hedonics - the relative pleasantness or unpleasantness of an odor sensed by the subject.

4. Detectability or quantity - the number of dilutions required to reduce an odor to its minimum detectable threshold odor concentration (Switzenbaum et al., 1997, Walker).

5. Mass - total mass per unit time or the volume of odorous air produced.

APPLICABILITY

Odor Control at Biosolids Processing Facilities

Biosolids processors are faced with odors during thickening, digestion, dewatering, conveying, storage, truck loading, air drying, composting, heat drying, alkaline stabilization, and/or incineration. The odors may be point sources or ambient air (in a belt press room for example.) The odors may emanate from point sources or be present in ambient air from area sources. A comprehensive odor audit and air dispersion modeling is the best assurance that capital and operating dollars are spent wisely. Facility owners should look for a consultant who specializes in biosolids odor control when initiating an odor audit. An odor audit will accomplish the following:

- Quantify odors from each odor emissions source.

- Analyze for odor causing compounds.

- Determine the processes by which odor causing compounds are formed.

- Identify the most significant odor sources.

- Obtain data for odor emissions air dispersion modeling.

- Determine the most cost effective odor management plan.

Good management practices or modification to the operation may reduce odor emissions; however, odor containment and treatment at the biosolids processing facility may be necessary to control downwind effects.

The value of air dispersion modeling prior to final design should not be underestimated. Information obtained from modeling may result in design changes such as; increasing stack height, increasing stack velocity, providing reheat to increase thermal buoyancy, or dilution with ambient air. (Haug, 1990) These low cost features can save significantly on capital and operating costs and improve effectiveness.

Likewise, effective communication with the affected community is important to enhance odor management and reduce the number of complaints.

Odor Control at Land Application Sites

The biosolids producer should accept responsibility for odor control at land application sites. Even if the producer hires a contractor to provide transportation, storage, or land application services, the terms of the agreement should include management practices to minimize odors. In addition, the generator and contractor should have an odor response plan in place to provide guidance and policy on documenting and responding to odor complaints. The land applier should have the ability and responsibility to divert biosolids from a site that is experiencing odor problems.

Biosolids producers should make every effort to minimize odors at the application site because the long term efficacy of land application depends on it. A dramatic increase in local ordinances that ban or restrict the use of biosolids has been observed in recent years as a result of odor complaints. A nationwide survey (Biocycle 1999 revealed that odors at land application sites were usually the initial operating problem that resulted in complaints, which were followed by questions and often, organized public opposition.

Federal Biosolids Regulations do not regulate odors because it was believed that odors from land application did not present human health effects. It has been said, however; "Biosolids odors may not pose a health threat, but odors are killing public support for biosolids recycling programs." (Toffey, 1999)

The most cost-effective approach to odor control may be to examine the operation and maintenance practices at the processing facility. Septic conditions may result in a biosolids product that is more offensive than necessary. Some polymers break down into odor forming compounds under high heat and elevated pH. Incomplete anaerobic digestion can result in worse odors than no digestion at all. Blending of raw and WAS prior to liquid storage can result in higher concentrations of Dimethyl Sulfide. (Hentz and Cassel, 2000)

Methods to reduce odors at land application sites include:

- Properly stabilize, condition and manage biosolids at the treatment works to minimize odors from the final product.
- Select remote sites and fields away from neighbors (USEPA & USDA,2000).
- Apply well stabilized material.
- Clean tanks, trucks, and equipment daily.
- Whenever possible, subsurface inject or incorporate biosolids into the soil (WEF 1997).
- Minimize the length of time biosolids are stored (USEPA & USDA,2000).
- Reduce visibility and maximize the distance of the storage area from occupied dwellings (USEPA & USDA,2000).
- Avoid land application when wind conditions favor transport of odors to residential areas (USEPA & USDA,2000).
- Plan field storage of biosolids based on the stability, quantity, and length of time biosolids are stored in addition to the location of the site with respect to nearness to neighbors and the meteorological conditions (USEPA & USDA,2000).
- Avoid land application when nearby residential areas are planning outdoor activities or around holidays such as Memorial Day, Independence Day, and Labor Day WEF 1997).
- Develop an odor control plan and train all staff to identify and mitigate odors.
- Have alternate management including land-filling for particularly malodorous batches of biosolids.

Process Management

The degree of odor control necessary for biosolids processing facilities is determined by site-specific criteria such as:

- The current and future proximity of a site to residential or commercial developments.
- Local wind patterns, air mixing and dispersion (air stability) factors.
- Temperature and humidity.

- The variability of the above factors on a daily and seasonal basis.

- The amount of biosolids being processed.

A computerized air dispersion model that addresses magnitude, frequency, and duration of events, and is calibrated and verified with on-site monitoring, can be an effective tool to predict the impact of odor emissions. This type of model may determine how much and what type of control will be necessary to prevent or minimize the impact. To accomplish this task with some certainty of success, a formal odor study should be commissioned.

During the planning or preliminary design of a proposed biosolids processing facility, an odor study should be conducted in light of the knowledge and experience gained from successful operations at similar facilities. For existing facilities that have nuisance odor problems, the study should determine the degree to which specific unit processes or area sources contribute to the offsite impact. A detailed sampling and monitoring program should be conducted to determine a not-to-exceed nuisance odor level. Liquid and gas samples can be chemically analyzed for specific odor compounds. Both direct sensory measurements of odor intensity and odor strength are also useful to identify the sources of the complex mixture of odor compounds typically responsible for nuisance complaints. Direct sensory measurements are conducted by a panel of trained observers (expert noses) which analyzes and rates air samples in terms of odor intensity (n-butanol scale) and odor strength (dilution to threshold or D/T scale.) A comprehensive odor study should result in a full understanding of the source and nature of the odor emissions, identify available methods of odor control, and establish criteria to measure the effectiveness of the control technology.

Local ordinances may establish the degree of odor control required. Generally, the ordinances are written to prevent nuisance conditions at and beyond the facility property lines. Numerical limits of allowable concentrations of odorous compounds are specified in some localities, while others specify the frequency and/or duration of the detection of off-site odors as the criteria for violation of nuisance standards.

Sources of Odor

Wastewater collection systems with long detention times can result in septic conditions throughout the wastewater treatment plant and subsequent odor problems in biosolids handling and end use. Aerated static pile, windrow and in-vessel composting processes can produce objectionable odors if anaerobic conditions occur and even with aerobic conditions. Ventilation of air through the compost material helps to control composting temperature, maintain aerobic conditions, and provide a means to direct the exhaust air stream into an odor control device. The alkaline pasteurization process produces ammonia as well as other odor-causing compounds. Large scale facilities are often enclosed and ventilated to a wet chemical scrubber. Heat drying facilities usually use wet scrubbers and/or afterburners such as regenerative thermal oxidizers.

Biosolids processing facilities can be operated and managed to reduce odor generation and emissions. The quantity and intensity of odorous compounds can be reduced by:

- Operation and maintenance procedures to prevent anaerobic conditions.

- Addition of oxidizing agents to prevent formation of hydrogen sulfide.

- Selection of polymers which are resistant to breakdown at high temperatures and pH.

- Optimizing all stabilization processes such as anaerobic digestion, aerobic digestion, or alkaline stabilization.

- Evaluate the impacts of blending different types of solids and storage. (Hentz and Cassel)

- Scrubbing with a properly operated chemical scrubber or biofilter.

Addressing O&M optimization may result in dual benefits. First, it will reduce the amount and intensity of odors generated at the site, minimizing costs of odor control equipment. Second, it will generate a less odorous product, which will be easier to store, transport, utilize, or market.

OVERVIEW OF ALTERNATIVES

Current Status

Current methods to control odors from biosolids production facilities include biofilters, activated sludge basins, wet chemical scrubbers, regenerative thermal oxidizers, and odor counteractant or neutralizing agents. The method chosen should be based on the results of an odor audit and the type of odor causing compounds present.

Biofilters- Description

Biofilters remove odors from a foul air stream by the adsorption and absorption of odor causing compounds onto a natural media bed where microorganisms oxidize the compounds. The indigenous bacteria and other microorganisms of the media acclimate to the compounds present and are sufficient to provide the "scrubbing" action; no bacterial innoculation or chemical addition is required. Biofilters commonly are used to treat the air from all types of composting operations.

Biofilters-Advantages and Disadvantages

Advantages

Biofilters provide significant reduction of overall odor emissions including Volatile Organic Carbon emissions. It is a simple technology with minimum moving parts and low energy requirements. Cold winter temperatures do not affect biofilter performance. Biofilters have a low profile and are not as visible to neighbors as a system requiring a stack. All the above advantages are true if biofilters are properly sized, kept moist, and renewed periodically.

Disadvantages

A major limitation of biofilters is the large land area required for installations. The size of the biofilter surface area is directly related to the airflow to be treated and the need to provide about a 45 to 60 second detention time. Poor biofilter performance is usually attributed to lack of moisture in the filter media. Other performance inhibitors are short-circuiting, pH depression, and high temperatures. A concentration of ammonia greater than 35 ppm in the foul air stream may cause a toxic accumulation of ammonium in the media, leading to reduced ammonia removal efficiency. The need to keep the biofilters moist results in a significant amount of water usage and the need to treat or dispose of leachate and condensate. Design criteria are not well established and biofilters may not be appropriate for very strong odors.

Biofilters -Design Criteria

The medium is a mixture of materials that may include bark, wood chips, yard waste or agricultural waste compost, peat moss, sand, pulverized volcanic rock, or oyster shells.

Oyster shells, or similar materials, can provide pH control within the media. (Haines et al). Rock, sand and bark are necessary to provide and maintain porosity of the bed. The medium may be kept moist by spray nozzles in the foul air collection system and at the top of the biofilter surface.(Haines et al).

Sometimes, water is also added inside the filter through drip piping. The media bed is placed over an air distribution system consisting of perforated piping installed within a bed of gravel. An impermeable membrane, such as a HDPE or PVC liner, is placed under the gravel to facilitate leachate collection and disposal. The biofilter can be constructed within a compacted soil trench or between soil berms. If the biofilter is installed within a concrete, masonry, plastic or similar container, the container must be designed to prevent short-circuiting at the side walls and to resist corrosion from the acidic leachate.

The size of the biofilter is determined by the airflow to be treated. The accepted loading rate of a biofilter is 3 to 4 cfm per square foot of media bed, with a media bed depth of 3 to 4 feet. Design should provide for ease of removal because biannual replacement or replenishment of the media may be required. Periodic mixing or turning of the media may be required to maintain the design air flow and head loss through the odor control ventilation system.

Biofilters are widely regarded as an effective, low cost method of treating low to moderate odorous air. A well operated and maintained biofilter can reduce odors by 95% or greater (Schiffman et al) (Boyette and Bergstedt). In some cases, biofilters have resulted in the elimination of odor complaints. (Alix). In other cases, improved composting operations and biofilter renovation combined resulted in a reduction of odor complaints. (Haines et al).

Biofilters -Operation and Maintenance

It is important that biofilters be kept moist so that the microbial community remains healthy and effective. The goal is to operate the biofilters as close to 100 percent humidity as possible. It is also important to keep sufficient void space and avoid air channeling, which results in short circuiting the media. Large amounts of dust and particulate matter in the foul air will build up in the biofilter media and shorten the replacement time. In addition, back pressure on the blowers will increase maintenance requirements. An appropriate temperature range must be maintained to keep the microbial organisms healthy and functioning. High temperature air (130-140 deg F) from composting processes contains high concentrations of ammonia that may be toxic to microorganisms. A typical biofilter life expectancy is one to seven years with biofilter replacement every two years. Operators should develop a biofilter performance monitoring protocol for routine assessment of odor control efficiency.

Activated Sludge Basins -Description

Similar to biofilters, the activated sludge basins used for secondary treatment at municipal wastewater treatment plants can provide odor removal by adsorption, absorption, condensation and microbial oxidation.

Activated Sludge Basins -Advantages and Disadvantages

Advantages

This can be a very cost effective alternative for facilities which operate aeration basins. (Bowker) Costs are usually lower for both capital and operating expenses. Systems have been in operation for over 40 years, and more than 25 facilities have used this technology. This system is effective in treating moderate to high strength odors. Activated-sludge basins are simple, with low operation and maintenance considerations (WEF MOP 24).

Disadvantages

Concerns about blower corrosion have been the major impediment to use of activated sludge basins. However, steel inlet filters and piping are more common points of corrosion. There are reports of accumulation of a tar-like substance or greasy film on the internal components of blowers, and the volume of foul air to be treated may exceed the demand of the aeration tanks. The method may not be appropriate for very strong odors.(WEF MOP 24)

Design Criteria - Activated Sludge Basins

The foul air is ventilated through a dedicated blower and diffuser system or through the process air distribution system. The foul air diffuser should be submerged at least eight feet to achieve high odor removal efficiency. The blower and diffuser equipment must be designed to withstand the corrosive nature of the air stream. Use of stainless steel, PVC, and moisture traps will minimize corrosion. The foul air volume can be minimized by using flat gasketed covers on tanks or individual enclosures for dewatering or blending equipment. Inlet covers will prevent particulate accumulation in fine bubble diffusers. Deep bed nitrification biotowers are also used for odor control.(Lutz et al)

Operation and Maintenance - Activated Sludge Basins

If a diffused aeration system already exists, little or no increase in O&M costs should be expected. The blowers and air filters must be cleaned periodically and the system monitored for odor causing compounds.

Wet Chemical Scrubbers

Wet Scrubbers are best suited to treating high intensity odor emission and large air volumes. They are usually used at alkaline stabilization facilities, biosolids drying facilities and incinerators. There are several types of wet scrubbers, the most commonly used in biosolids facilities include packed bed, mist, and venturi scrubbers. All are designed to maximize the contact between the odorous compounds of the foul air stream and a "scrubbing" chemical solution. The compounds are absorbed and then oxidized by the chemicals. The performance of a wet scrubbing system depends on the solubility of the odors in the scrubbing solution. This should be determined by testing or from previous installations.(Heller and Heller) Multiple stage systems, using water or acid in the first stage to remove the ammonia, followed by a chlorine or caustic and chlorine in the second stage to remove sulfur based compounds, are used to treat composting odors and more commonly the ventilated air from alkaline pasteurization facilities.

Advantages and Disadvantages - Wet Chemical Scrubbers

Advantages

A two or three stage scrubber system can remove a wide variety of odor-causing compounds. The units have proven to have variable chemical consumption and to be effective and reliable.

Disadvantages

There is a potential for emission of chlorinated compounds and particulate from the scrubber exhaust stack, as well as a potential for emission of a bleach odor if chemical feed is not properly controlled. Chemicals, power, and maintenance can be expensive, and large amounts of water are needed. The spent chemical must be properly disposed, and softening is required for the water.

Design Criteria - Wet Scrubbers

The three most common types of wet scrubbers are packed bed scrubbers, mist scrubbers and venturi scrubbers.

Packed beds use a shower of scrubbing liquid over a bed of high-surface-area plastic media to promote droplet and film contact within a reaction chamber. The foul air is ventilated through the plastic media in a direction that is co-current or counter-current to the liquid flow. The advantage of a packed scrubber is that the concentration of the scrubbing solution can be varied in response to fluctuating odor levels. These units are usually the least costly method of treating high intensity odors at dewatering and storage facilities. *Mist scrubbers* use compressed air to atomize a stream of scrubbing liquid and a controlled ventilation pattern within the reaction chamber to promote contact without the use of media. Advantages of mist scrubbers include a lower water usage and the ability to handle a wide range of flow rates. The disadvantages of mist scrubbers are O&M costs of the air compressor, larger space requirements, and the small clearances on the spray nozzles require water softening and occasional acid washes (Heller and Heller). *Venturi scrubbers* are similar in operation to mist scrubbers, but atomize a high-pressure stream of scrubbing liquid without compressed air. The type of scrubbing liquid used depends on the odor compounds to be treated. A combination of sodium hydroxide and sodium hypochlorite is effective for sulfide odors, while dilute sulfuric acid is effective for ammonia odors.

Effective cooling of the scrubber gasses is also needed for ammonia removal (Horst et al, 1991).

Operation and Maintenance - Wet Chemical Scrubbers

Wet scrubbers require pumps, compressors, valves, and instrumentation. As a result, operation and maintenance costs are significant. Occasional maintenance and calibration is required for the chemical supply system, liquid distribution nozzles and ORP (oxidation reduction potential) and pH probes. System maintenance can normally be performed without interrupting the treatment. However, mist scrubbers may require slightly more nozzle maintenance because of the use of finer spray nozzles.

Variable odor concentrations and constituents in the process air will make scrubber operations difficult and reduce effectiveness. Composting operations have found that improving compost operations, specifically mixing and uniform aeration, results in less variability in dimethyl disulfide concentrations in the scrubber feed air. Fewer and smaller operating adjustments are required to maintain optimum scrubbing conditions. (Murray et al, 1991)

Regenerative Thermal Oxidizers (RTO's)

RTOs use a high temperature to incinerate airborne compounds in a short residence time combustion chamber. This technology is usually used for biosolids heat dryers, incinerators, or evacuation air from biosolids storage tanks.

Advantages and Disadvantages - RTO's

Advantages

RTOs typically are used for VOC emission control, with odor removal being incidental. This equipment is compact compared to the area needed for wet scrubbers or biofilters. They are well suited to treating low volume, high strength air streams. RTO's are more energy efficient than conventional afterburners requiring only 10 to 20 percent of the energy. Thermal efficeincies are often 90 to 95% and the use of digester gas can reduce fuel costs.

Disadvantages

There are relatively few applications of RTOs specifically for the control of biosolids processing odors. Operators report these units are a significant fuel cost. The system is only economical for high-strength, difficult-to-treat air streams.

Design Criteria - RTO's

The required temperature in the combustion chamber is 1,350 to 1,600 degrees F with a detention time in the range of 0.3 to 3 seconds. It is also important to configure the system to provide sufficient turbulence and oxygen for efficient combustion. (Heller and Heller, 1999) The RTO may be fueled with fuel oil or natural gas, and heat exchangers recover much of the exhaust gas heat to preheat the incoming air.

Operation and Maintenance - RTO's

RTO's are an expensive odor control technology to operate and maintain. High temperatures result in significant fuel costs and frequent maintenance and/or replacement of instrumentation.

Counteractants, Neutralizing Agents and Oxidizang Agents

These products are used to reduce the impact of odors from area sources, such as biosolids curing or storage piles and point sources such as ventilation exhaust stacks. Essential oils and proprietary compounds are used as odor masking agents and as odor neutralizing or counteracting agents. These materials generally are non-toxic and non-hazardous to humans and the environment. They may be dispersed as a fine mist into the air at processing facilities or added to the liquid waste streams.

Oxidizing agents released into the wastewater react with odor causing compounds to form a more stable, odor free compound.

Advantages and Disadvantages - Counteractants, Neutralizing Agents and Oxidizing Agents

Advantages

The use of counteractants and neutralizing agents can be initiated quickly at a low capital cost. The use of oxidizing agents, or counteractants, in the waste stream can greatly reduce odors in the workplaces especially around thickening and dewatering equipment. At some facilities the addition of potassium permanganate, an oxidizing agent, temporarily reduces odors in the biosolids product,(Pisarczyk and Rossi) thereby making land application less objectionable to a farmer's neighbors. Some plants also observe improved dewatering when using potassium permanganate.

Disadvantages

It is possible that the perfume-like odor from some neutralizing agents may be perceived as an objectionable or nuisance odor. The effectiveness of neutralizing agents are limited to the area in which they can be dispersed. Oxidizing agents can act as a bactericides and inhibit biological processes. The presence of non-odorous substances that react with the oxidizer, will greatly increase the cost of treatment.(WEF) Oxidizing agents are not always effective and are sometimes expensive. The system has a poor database and limited information on odor removal efficiency.

Design Criteria - Counteractant, Neutralizing Agents and Oxidants

Essential oils and proprietary compounds are dispersed into the foul air stream as a vapor or fine mist. Either a reaction chamber is provided to maintain a contact and residence time or the ventilation ductwork or exhaust tower is used to apply the agent. Some products are claimed to polymerize and precipitate odor molecules from the air stream. The neutralizing agents are sometimes sprayed continuously in the vicinity of odorous tanks, truck loading or storage areas.

Another design uses oxidizing agents such as chlorine, hypochlorite, chlorine dioxide, hydrogen peroxide or potassium permanganate to prevent septic conditions and the resultant hydrogen sulfide odors. A small amount of oxidant is blended with wastewater or liquid wastewater solids. A potassium permanganate dose of 0.3% can reduce the Threshold Odor Number from 1500 to 200. The required dosage is dependent on pH. Less potassium permanganate is needed at pH 5 or 7 than at pH 9 (Pisarczyk. and Rossi, 1992).

Operation and Maintenance - Counteractants, Neutralizing Agents and Oxidizing Agents

Once the proper dosage is determined, operation and maintenance is relatively simple. Routine maintenance of pumps, spray nozzles and automated systems is required.

PERFORMANCE

The following table shows removal efficiency for a variety of odor control technologies. Within the past 5 years, the design and operation of biofilters has been optimized and is now better understood than ever. Most work on biofilter is for use at composting facilities but due to their low cost, they are also being examined for heat drying facilities.

TABLE 1 REPORTED REMOVAL EFFICIENCIES

System	H_2S	NH_3	Odor Units (D/T)
Biofilter	> 98%	> 80%	> 95%
Activated Sludge (coarse bubble)	< 85% - 92%	> 90%	90 - 95%
Activated Sludge (Fine Bubble)	> 99.5%	N/A	> 99.5%
Wet Scrubbers	> 95%	> 95%	< 80%-99%
RTO	N/A	N/A	> 95%
Chemical oxidants	>99%[1]	N/A	up to 99%
Counteractants and neutralizing agents	30%	30%	N/A

[1]Hydrogen sulfide concentration measured above the conveyor leaving the centrifuge.

Source: Schiffman et,al, Williams, Ostojic & O'Brien, Giggey et al, Solomon, LeBeau & Milligan, Pisotti, Singleton et al; Vaith et al; Ficek.

As with any odor control equipment, removal efficiency is only one aspect of effectiveness. Odor modeling will identify odor receptors and determine the likelihood of odors being detected off-site.

TABLE 2 RELATIVE COSTS OF ODOR CONTROL TECHNOLOGIES

System	Overall	Capital	Operation/ Maintenance	Electrical or fuel	Supplies/ Chemicals	Effectiveness
Biofilter	Moderate	Moderate- but land area needed	Moderate	Low	Water needed	High>95% in compost
Activated Sludge Basins	Low, if existing system	Low, if existing system	Low, if existing system, may corrode blowers	Low , if existing system and biosolids processing facility is close	Low	High 90-95% for H2S and Ammonia
Wet Chemical Scrubbers	High	High-up to 50% of total plant costs	High - much high speed equipment + instrumentat'n	High - must move water at high pressure	High - chemical costs and water demand	High <80%-99% handles alkaline stab and all plant odors
Regenerative Thermal Oxydizers	High	Moderate	High- due to high temp equipment	High - tremendous heat demand	High - oil or gas	Good for organic odorants from incinerators, and heat dryers
Oxidizing Agents	Varies- moderate to high	Low	Low- just mat'l handling issues	Low - small pumps required	High - potassium permanaganate can be expensive	Varies from one plant to another
Counteractant & Neutralizing Agents	Moderate	Low- moderate	Varies from one plant to another	Low	High - usually patented compounds	Varies, but may help at end use site.

Source: Hentz et al, Haines et al, Giggey, Ostojic and O'Brien, Pisarczyk and Rossi, Ponte, Bowker, Vaith et al, Williams, Wu.

COSTS

Costs for odor control will vary significantly from one location to another and from one technology to another. At the Hoosac Water Quality District (HWQD) composting facility the biofilter was less than 3% of the capital cost and media replacement was about 7% of O&M costs (Alix,1998) . Multistage wet scrubbers and RTO's can result in 30 to 50% of capital and operating costs of a biosolids processing facility. Potassium permanganate costs $1M per year at a facility that dewaters and incinerates 60 dry tons per day (DTPD) which equates to $45 per dry ton.

The following table compares the cost factors for each technology. In addition, biosolids processing facilities should budget funds to conduct a facility wide odor audit, use odor modeling whenever possible, avoid septic conditions in wastewater and solids, evaluate polymers and liquid blending and storage practices, maintain records of odor complaints and conditions, and incorporate language in land application contracts to assure best management practices.

REFERENCES

Other Related Fact Sheets

Alkaline Stabilization of Biosolids
EPA 832-F-00-052
September 2000

In-Vessel Composting
EPA 832-F-00-061
September 2000

Land Application of Biosolids
EPA 832-F-00-064
September 2000

Centrifugal Dewatering and Thickening
EPA 832-F-00-053
September 2000

Filter Belt Press Dewatering
EPA 832-F-00-057
September 2000

Recessed Plate Filter Press Dewatering
EPA 832-F-00-058
September 2000

Other EPA Fact Sheets can be found at the following web address:
http://www.epa.gov/owmitnet/mtbfact.htm

1. Alix, Charles M., "Retrofits Curb Biosolids Composting Odors" Biocycle Magazine, June, 1998.

2. Basset, D.J., Dedovic-Hammond, S., Haug, R.T. "A Unique Approach to Implementation of Biofiltration for Odor/VOC Control."

3. Bertucci, J.J.; Sawyer, B., Calvano, J.; Tata, P.; Zenz, D.R.; Lue-Hing, C.; "The Application of Odor Measurement Technologies to Large-Scale Odor Evaluation Studies." Odor and Volatile Organic Compound Emission Control for Municipal and Industrial Treatment Facilities Proceedings. Florida Water Environment Association. Jacksonville. 1994.

4. Biosolids Field Storage Guide (draft,) 2000, USDA, USEPA, WEF.

5. Bonnin, C., Coriton, G., Brailey, D., Rogalla, F. "Biological odor removal." WEFTEC '95 68th Annual Conference & Exposition Proceedings. Volume5. Miami Beach. 1995.

6. Bowker, Robert. WEF MOP 24 "Septage Handling." Chapter 7 Odor Control. 1997

7. Bowker, Robert P.G. "Activated sludge Diffusion; Clearing the air on an overlooked odor control technique." Water Environment and Technology, WEF Feb. 1999

8. Boyette, R.A and Bergstedt, Loren, "Wastewater Treatment Plant Odor Control Using a Biofiltration System in Diluth, MN" The ninth International Conference on Cold Regions Engineering Sponsored by the american Society of Civil Engineers, September, 1998

9. Brown, T.M. "Multiple Contracts Provide for Complete Regenerative Thermal Oxidizer Odor Control." Odor and Volatile Organic Compound Emission Control for Municipal and Industrial Treatment Facilities Proceedings. Florida Water Environment Association. Jacksonville. 1994.

10. "The Cairox(R) Solution System: Case History The Perfect Solution to Complaints about Wastewater Treatment Plant Odors." Carus Chemical Company. 1997.

11. Callery, A.G.; Kulas, A.; Sweeney, J. "Biofilters: How Well Do They Work with Thermal Biosolids Dryers." 10th Annual Residuals & Biosolids Management Conference: 10 years of Progress and a Look Toward the Future Proceedings. Rocky Mountain Water Environment Association. Denver. 1996.

12. Chlupsa, Henry J. "Evaluation, Abatement and Monitoring of Odors at the Yonkers Joint Wastewater Treatment Plant Yonkers, New York." WEF 1997 Control of Odors and VOC Emissions Specialty Conference. Houston.

13. Cranny, P.C. "New Advancements in Odor Control Using Essential Oil Technology." Odor and Volatile Organic Compound Emission Control for Municipal and Industrial Treatment Facilities Proceedings. Florida Water Environment Association. Jacksonville. 1994.

14. Dodd, K.M.; Novy, V.A.; Caballero, R.C. "Total Control of Odors and VOCs from In-Vessel Composting." Odor and Volatile Organic Compound Emission Control for Municipal and Industrial Treatment Facilities Proceedings. Florida Water Environment Association. Jacksonville. 1994.

15. Fergen, R.; DiFiore, R.S.; Davis, P.A.; Saurer, P. "Modifications of the Class A Alkaline Stabilization Process to Enhance Heat Release, Odor Control, Handling Characteristics and Nutrient Value." 10th Annual Residuals & Biosolids Management Conference: 10 years of Progress and a Look Toward the Future Proceedings. Rocky Mountain Water Environment Association. Denver. 1996.

16. Ficek, Kenneth J. "Potassium Permanganate Controls Sewage Odors." Carus Chemical Company.

17. Giggey, M.D.; Dwinal, C.A.; Pinnette, J.R.; O'Brien, M.A. "Performance Testing of Biofilters in a Cold Climate." Odor and Volatile Organic Compound Emission Control for Municipal and Industrial Treatment Facilities Proceedings. Florida Water Environment Association. Jacksonville. 1994.

18. Goldstein, Nora. "Longer Life for Biofilters." Biocycle Magazine, July 1999.

19. Haines; Welch; Brandt; and Alpert. "Biosolids Composting Facility Processing and Odor Control Improvements, a Case Study." WEF/AWWA Joint Residuals and Biosolids Management Conference, 1999.

20. Hansen, N.G.; Rasmussen, H.H.; Rindel, K. "Biological Air Cleaning Processes Exemplified by Applications in Wastewater Treatment and Fish Industry." Odor and Volatile Organic Compound Emission Control for Municipal and Industrial Treatment Facilities Proceedings. Florida Water Environment Association. Jacksonville. 1994.

21. Hatfield, N.L.; Burnham, J.C. "Characterization of Odors in Untreated and EQS Processed Dewatered Municipal Wastewater Sludges." Odor and Volatile Organic Compound Emission Control for Municipal and Industrial Treatment Facilities Proceedings. Florida Water Environment Association. Jacksonville. 1994.

22. Haug, Roger T, "An Essay on the Elements of Odor Management" Biocycle Magazine, October, 1990

23. Heist, J.A.; Hansen, N.G.; and Rasmussen, H.H. "Control of Odor Emissions from Wastewater Treatment Plants in a Bioscrubber." WEFTEC '95 68th Annual Conference & Exposition Proceedings. Volume 5. Miami Beach. 1995.

24. Heller, Kenneth J. and Heller Jon D., "Odor Control Alternatives for Wastewater Treatment Plants and Collection Systems"1999

25. Hentz, L.H. "The Chemical, Biological, and Physical Origins of Biosolids Emissions: A Review." (Undated)

26. Hentz, Lawrence H.; Murray, Charles M.; Thompson, Joel L.; Gasner, Larry L.; and Dunson, Jr., James B. "Odor Control Research at the Montgomery County Regional Composting Facility." Water Environment Research. Volume 64. Number 1. 1992.

27. Hentz, L.H. and Toffey, W.E. "Biosolids Air Emissions are Good Indicators of Process Conditions." 10th Annual Residuals & Biosolids Management Conference: 10 years of Progress and a Look Toward the Future Proceedings. Rocky Mountain Water Environment Association. Denver. 1996.

28. Hentz, Jr., Lawrence H.; Toffey, William E.; and Schmidt, C.E. "VOCS, HAPS and Odor Compounds: Understanding the Synergy Between Composting and Air Emissions." "Biocycle." March 1996.

29. Hentz, Jr., Lawrence H, Cassel,Alan F. "Separating Solids Solves Odor Emission Problems" Biosolids Technical Bulletin, July August, 2000

30. Horst, William G, Matterhorn, Frank, Vold, Stephen H, Walker, John M., "Controlling Compost Odors" Biocycle Magazine, November, 1991

31. Kolton-Shapira, R. "Biofilters in Action." Odor and Volatile Organic Compound Emission Control for Municipal and Industrial Treatment Facilities Proceedings. Florida Water Environment Association. Jacksonville. 1994.

32. LeBeau, A.; and Milligan, D. "Control of Hydrogen Sulfide Gas from a Wastewater Lift Station Using Biofiltration." Odor and Volatile Organic Compound Emission Control for Municipal and Industrial Treatment Facilities Proceedings. Florida Water Environment Association. Jacksonville. 1994.

33. Lee, Jong S.; Quijano, Carlos; Hagan, David C.; and Raben, Craig A. "Comprehensive Odor Control System Design is Key to Wastewater Treatment Plants Near Residential Areas." WEF 1997 Control of Odors and VOC Emissions Specialty Conference. Houston.

34. Lutz, M.P.; Davidson, S.J.; and Stowe, D.W. "Control of Odor Emissions at the Littleton/Englewood Wastewater Treatment Plant." Odor and Volatile Organic Compound Emission Control for Municipal and Industrial Treatment Facilities Proceedings. Florida Water Environment Association. Jacksonville. 1994.

35. McDonald, H.S.; Clinton, T.A.; Demir, J.; Bertolero, A.M.; and Bailey, J.P. "Reducing Odor/VOC Emissions and Pilot Testing of High Performance Carbon and a Hydrogen Peroxide Mist Tower." WEFTEC '95 68th Annual Conference & Exposition Proceedings. Volume 5. Miami Beach. 1995.

36. McGinley, C.M.; and Mann, J. "International Standard Methods of Olfactometry and Associated Methods Used by Major Sewerage Districts for the Assessment of Stationary and Ambient Odors." Odor and Volatile Organic Compound Emission Control for Municipal and Industrial Treatment Facilities Proceedings. Florida Water Environment Association. Jacksonville. 1994.

37. Murray, Charles M. Thompson, Joel L., Ireland, James S., "Process Control Improvements at Composting Sites" Biocycle Magazine, December, 1991

38. Nelson, M. Goff; and Utter, S. "Reduction of Offensive Odors Through Biofiltration – A Case Study." 10th Annual Residuals & Biosolids Management Conference: 10 years of Progress and a Look Toward the Future Proceedings. Rocky Mountain Water Environment Association. Denver. 1996.

39. Nowak, Mickey J. "Fast-Track Odor Control: A Chemical Solution Stifles Odors, Neighbor's Complaints at Regional Treatment Plant." "Operations Forum." Volume 10. Number 6. August 1996.

40. Ostojic, N., O'Brien, M., "Control of odors from sludge composting using wet scrubbing, biofiltration and activated sludge treatment." Odor and Volatile Organic Compound Emission Control for Municipal and Industrial Treatment Facilities Proceedings. Florida Water Environment Association. Jacksonville. 1994.

41. O'Brian, Joseph E. "Design for Change." "Operations Forum", WEF, July 1999.

42. Pisarczyk, Kenneth S. and Rossi, Laurie A. "Sludge Odor Control and Improved Dewatering with Potassium Permanganate." Presented at the 55th Annual Conference of the Water Pollution Control Federation. St. Louis, Missouri. 1992.

43. Pisotti, D.A. "Evaluation and Comparison of Biofiltration and Conventional Odor Control Technologies." Odor and Volatile Organic Compound Emission Control for Municipal and Industrial Treatment Facilities Proceedings. Florida Water Environment Association. Jacksonville. 1994.

44. Ponte, Manual, P.E. "A Survey of Odor Control Techniques Being Utilized for Composting and Chemical Stabilization of Biosolids." The 4th Joint WEF & AWWA Conference Biosolids & Residuals Management. Kansas City. 1995.

45. Porter, R.C., Hoydysh, W.G., Barfield, E.T. "Odors: Demonstrating Compliance at Publicly-Owned Treatment Works." Odor and Volatile Organic Compound Emission Control for Municipal and Industrial Treatment Facilities Proceedings. Florida Water Environment Association. Jacksonville. 1994.

46. Richardson, B. "Automated Control of Hydrogen Peroxide in Odor Control Technology." Odor and Volatile Organic Compound Emission Control for Municipal and Industrial Treatment Facilities Proceedings. Florida Water Environment Association. Jacksonville. 1994.

47. Rosenfeld, P., "Characterization, Quantification, and Control of Odor Emissions from Biosolids Application to Forest Soil." Ph.D. Dissertation.University of Washington, Seattle, WA.1999.

48. Yonkers Joint WWTP. Process compatibility testing D. Odor. In Specifications for Furnishing and Delivering Liquid Emulsion type polymer (40-50 percent active) for Centrifuge dewatering of sludge. Yonkers Joint SSTP, Ludlow Dock, South Yonkers, NY. 1997.

49. Rudolph, Donald J., P.E. "Solution to Odor Problem Gives Unexpected Savings." Carus Chemical Company. 1992.

50. Schmednecht, D.A.; Sereno, D.J.; and Haug, R.T. "Optimizing Chemical Odor Scrubbers: ORP vs. Chlorine Concentration." WEFTEC '95 68th Annual Conference & Exposition Proceedings. Volume 5. Miami Beach. 1995.

51. Schiffman, S.S, Walker, J.M., Dalton, P. Lorig, T.S., Raymer, J.H., Shusterman, D., Williams, C.M. "Potential Health Effects of Odor from Animal Operations, Wastewater Treatment, and Recycling of Byproducts" Journal of Agromedicine, November or December, 2000

52. Singleton, B.; Kant, W.; Rosse, P.; Centanni, F.; and Lanzon, D. "H2S and VOC Removal Using a Modular Design Biofilter." Odor and Volatile Organic Compound Emission Control for Municipal and Industrial Treatment Facilities Proceedings. Florida Water Environment Association. Jacksonville. 1994.

53. Singleton, B.; and Milligan, B. "Removal of H2S, Methyl Mercaptan, Dimethyl Sulfide with Biofiltration." WEFTEC '95 68th Annual Conference & Exposition Proceedings. Volume 5. Miami Beach. 1995.

54. Solomon, M. "Soil Filter Beds: The West Coast Experience." Odor and Volatile Organic Compound Emission Control for Municipal and Industrial Treatment Facilities Proceedings. Florida Water Environment Association. Jacksonville. 1994.

55. Stillwell, S.A.; Hans, D.E.; and Katen, P.C., "Biological Scrubbing of Foul Air in Activated Sludge Treatment Reduces Odors and ROGs from Headworks and Primary Clarifiers." Odor and Volatile Organic Compound Emission Control for Municipal and Industrial Treatment Facilities Proceedings. Florida Water Environment Association. Jacksonville. 1994.

56. Switzenbaum, Michael S., Moss, Lynne H., Epstein, Eliot, Pincince, Albert B. 1997. Water Environment Research Foundation Defining Biosolids Stability: A Basis for Public and Regulatory Acceptance Project 94-REM-1.

57. Toffey, William, Presentation at the 1999 Biosolids Tekcon, PWEA, State College, PA

58. Torres, E.M.; Devinny, J.; Basrai, S.; Stolin, B.; and Webster, T. "Study of Feasibility of Biofiltration to Control VOC and Odorous Emissions from Wastewater Treatment Plants." Odor and Volatile Organic Compound Emission Control for Municipal and Industrial Treatment Facilities Proceedings. Florida Water Environment Association. Jacksonville. 1994.

59. Turk, A.; Mozaffari, J.; and Mahmood, K. "Caustic-Impregnated vs Ammonia-Injected Activated Carbon for Odor Control." Odor and Volatile Organic Compound Emission Control for Municipal and Industrial Treatment Facilities Proceedings. Florida Water Environment Association. Jacksonville. 1994.

60. USEPA and USDA "A Guide for Recommended Practices for Field Storage of Biosolids and Other Organic By-products Used in Agriculture and Soil Resource Management." Draft 2000

61. Vaith, K.; Cannon, M.; and Heydon, J. "Comparison of Packed Tower Scrubbers, Mist Scrubbers, and Biofilters for Hydrogen Sulfide Scrubbing." WEFTEC '95 68th Annual Conference & Exposition Proceedings. Volume 5. Miami Beach. 1995.

62. Vella, P.A. "Improving Odors, Dewatering, and Incineration of Biosolids with Chemical Oxidation." 10th Annual Residuals & Biosolids Management Conference: 10 years of Progress and a Look Toward the Future Proceedings. Rocky Mountain Water Environment Association. Denver. 1996.

63. Walker, John M., "Control of Composting Odors" Science and Engineering of Composting:Design, Environmental, Microbiological and Utilization Aspects" Published by Ohio Agricultural Research and Development Center, The Ohio State University, Wooster, Ohio (undated)

64. Walker, John M., "Fundamentals of Odor Control" Biocycle Magazine, September, 1991

65. WEF MOP 24 "Septage Handling." Chapter 7 Odor Control, 1997

66. Williams, T.O. "Biofiltration for Control of Odorous Emissions & VOCs from Wastewater & Sludge Processing Facilities." Odor and Volatile Organic Compound Emission Control for Municipal and Industrial Treatment Facilities Proceedings. Florida Water Environment Association. Jacksonville. 1994.

67. Wolstenholme, P., Piccolo, S., Finger, R., Yee, S.. Endres, J. "Comprehensive Odor and VOC Performance Tests on Biofilters." Odor and Volatile Organic Compound Emission Control for Municipal and Industrial Treatment Facilities Proceedings. Florida Water Environment Association. Jacksonville. 1994.

68. Wu, Nerissa, "Using Odor Modeling to Evaluate Odor Control and Improve Public Acceptance", 14th Annual Residuals and Biosolids Management Conference, WEF, Boston, MA 2000

ADDITIONAL INFORMATION

Post Buckley Schuh & Jernigan, Inc.
Larry Hentz, V.P. Wastewater Program Manager
One Town Center, Suite 302
4201 North View Drive
Bowie, MD 20716

National Biosolids Partnership
Peter S. Machno, Ph.D.
601 Wythe Street
Alexandria, VA 22313

Steve T, Welch
Assistant Executive to the Director
University Area Joint Authority
1576 Spring Valley Road
State College, PA 16801

U.S. EPA,
John Walker
Mail Code 4204
401 M St., S.W.
Washington, DC 20460

City of Los Angeles
Ray Kearney
12000 Vista Del Mar
Playa Del Rey, CA 90293

For more information contact:

Municipal Technology Branch
U.S. EPA
Mail Code 4204
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460

OWM MTB
Excellence in compliance through optimal technical solutions
MUNICIPAL TECHNOLOGY BRANCH

David Dubbink Associates
864 Osos Street, Suite D
Phone (805) 541-5325, Fax (805) 541-5326
dubbink@noisemanagement.com

October 7, 2016

RE: Noise Analysis - Hitachi Zosen Inova USA, LLC Proposed Anaerobic Digestion Plant (ADP) – DRC2015-00122

In light of comments made by the appellants (September 20, 2016), the following discussion responds to the expressed concerns and addresses the technical issues.

1. Conclusion

The Exterior Noise Level Standards in County's Noise Ordinance (§22.10.120) give day and nighttime limits for hourly noise exposure evaluated by two different metrics; Leq, which represents the energy average of sound over a period of time, and Lmax which represents the maximum noise level.

The Leq 41 dB noise level produced by the ADP, measured at 100 feet, complies with the noise ordinance standards of maximum Leq of 50 dB (daytime 7 am – 10 pm) and 45 dB (nighttime 10 pm to 7 am) for exterior noise levels adjacent to noise sensitive uses. Noise measurements made at an ADP in Germany indicate the sound is constant, with a maximum sound level not differing greatly from the acoustical average. The County standards for Lmax are 70 dB daytime (7 am – 10 pm) and 65 dB nighttime (10 pm to 7 am). The project conforms to both the Leq and Lmax standards.

2. Notes about Noise Metrics

In the County's Noise Element and Ordinances, sound exposure levels are described using several different metrics. This can be confusing, but the multiple metrics are useful for describing and for regulating various elements of the acoustical environment.

A table from our analysis appears as Table N-3, page 26 in the Mitigated Negative Declaration. It lists three different noise sources using different metrics for each.

- **Lmax** measures the maximum noise level. A regional jet departure produces maximum noise levels in the range of 75 to 85 Lmax at the site of the ADP. The sounds from ADP facility operations are relatively steady and do not generate significant single noise events. As noted above, the sound produced by the ADP is on the order of 41 Leq and is well below county standards.

- **Ldn** or Day Night Level is used to describe the overall noise setting. This measure includes all of the noise events experienced over a 24-hour period. The metric recognizes the greater intrusiveness of noises during quiet hours. Nighttime noise (10 PM to 7 AM) is given a 10 decibel penalty. This is the equivalent of counting a single nighttime event as ten times a daytime event. The Ldn metric is used in the County's regulations and reflects both state and national standards (Noise Element, Part 1 (page 3.2).

The County Ldn standard applies to land use compatibility with transportation noise sources such as the airport. Decibel is logarithmic and not a simple summation of individual noise measurements. With the high existing level of Ldn 75 at the site, an addition of noise from ADP operations is inconsequential (less than a fraction of a decibel).

- **Leq** represents the energy average of noise over a stated period, usually an hour. This metric was used to evaluate the operations of an ADP facility in Germany. As noted above, at a distance of 100 feet from the building housing the ADP the Leq was measured at 41 dB; below the maximum levels allowed by the County.

3. Noise Sensitivity – Office Uses

The ADP site is located in the County's Industrial (IND) land use category, as are the adjacent properties to the east and southeast. The County's ordinance has no specified standards controlling noise in the Industrial land use category. However, the land use category does allow office uses, which are identified as a noise sensitive activity by the County Land Use Ordinance (§22.10.120). As noted above, the project complies with the allowed exterior noise level standards for both the day and night limits for noise measured by Leq and Lmax.

It should also be noted that the analysis described levels at a reference point 100-feet from the ADP operation. Noise levels will diminish for properties more than 100-feet away from the ADP. Increasing the distance from the ADP facility diminishes the addition to current ambient noise levels.

4. Back-up Alarms

Federal Occupational Safety and Health Administration's (OSHA) regulations for back- up alarms require vehicles to have a reverse signal alarm "audible above the surrounding noise level".

The County Ordinance exempts safety signals and warning devices from noise standards (§22.10.120 A.3). While safety signals are exempt from noise standards, during standard operations trucks will enter the building for unloading of material from 9 am to 10 am and again from 2 pm to 2:30 pm. Unloading operations take approximately 12 seconds of reverse motion per truck.

5. Truck Activity

The ADP project does not generate a significant increase in traffic or truck trips. A substantial increase in traffic would be required to produce a significant increase in overall road noise levels.

The metrics used are complicated, but they provide useful methods and standards for managing noise impacts. This discussion is intended to provide a better understand the analysis of noise impacts. There is no change in the conclusions from the original analysis.

Sincerely

David Dubbink, Ph.D, AICP

RCH GROUP
11060 WHITE ROCK ROAD, SUITE 150-A RANCHO CORDOVA, CA 95670 (916)782-4427

TECHNICAL MEMORANDUM

TO San Luis Obispo County Board of Supervisors

FROM Paul Miller, Senior Air Quality Analyst
RCH Group

DATE October 10, 2016

SUBJECT Responses to Appeal Letter – Hitachi Zosen Inova Project

---

RCH Group (RCH) prepared air quality and greenhouse gases technical analyses that were used in the CEQA Initial Study/Negative Declaration for the Hitachi Zosen Inova Conditional Use Permit (File no. DRC2015-00122). This technical memorandum is our response to the air quality comments (Comment A-1 to A-5) in the September 20, 2016 appeal letter from Norman Beko, Mike Kyle, Paul Rys, and Kathy Borland.

Response to Comment A-1:

Table AQ-8 on Page 14 of the Initial Study shows Total Daily Emissions of 28.5 lbs/day of ozone precursors (ROG + NOx), which is above the SLO APCD significance threshold of 25 lbs/day, a potentially significant impact. This is after incorporating extensive mitigation by equipping the CHP unit with a selective catalytic reduction (SCR) converter with an oxidation catalyst (Oxicat). The proposed project would also generate benefits to air quality by eliminating organics from landfills and creating renewable energy, thus indirectly reducing emissions of ozone precursors and other pollutants. The air quality analysis does not quantify this positive air quality impact. The following mitigation measure was included in RCH Group's June 20, 2016 memorandum to Oasis Associates and should be included in the Initial Study. Total daily emissions from the proposed project would not exceed the SLO APCD daily significance threshold and would be less than significant after incorporation of the following:

Mitigation Measure: The Applicant shall work with the SLO County APCD to mitigate daily ROG + NOx (ozone precursor) emissions to a level below the ROG + NOx significance threshold prior to building occupancy. The Applicant shall implement at least eight mitigation measures from the list within APCD's *CEQA Air Quality Handbook*. If the Applicant cannot select and implement the required number of mitigation measures from APCD's list**,** the Applicant shall reduce air quality impacts to less than significant through off-site mitigation based upon the amount of emission reductions (i.e., 3.5 pounds per day) needed to bring the project's impacts below the significance threshold.

Operational daily and annual air quality emissions were estimated for both an initial year (project start-up) scenario and subsequent years of operation. Air quality emissions during the initial year would be less than subsequent years because biogas would be flared for the first few months of project operation until the biogas produced is of quality to be used as fuel in the CHP unit. Operational daily emissions of ozone precursors (ROG + NOx) would be 22.4 lbs/day during project start-up (flaring), which is less than the SLO APCD significance threshold of 25 lbs/day (RCH Group, March 29, 2016). Operational daily emissions of ozone precursors (ROG + NOx) during subsequent years would less than the SLO APCD significance threshold of 25 lbs/day with incorporation of the mitigation measure above. With implementation of mitigation, all air quality impacts would be less than significant.

Response to Comment A-2:

The Air Quality Technical Report (March 29, 2016) referenced in the Initial Study included a comprehensive discussion of the exposure of sensitive receptors to substantial air pollutant concentrations from the proposed project and concluded that the potential impact would be less than significant. Key information from that analysis is included below in the response to this comment.

Air quality regulations focus on criteria air pollutants (i.e., CO, NOx, PM10, and PM2.5) as well as toxic air contaminants (TAC). A TAC is an air pollutant that may cause or contribute to an increase in mortality or serious illness, or that may pose a hazard to human health. TAC are usually present in very low concentration in the ambient air; however, their high toxicity or health risk may pose a threat to public health even at low concentrations.

There is growing evidence that indicates that exposure to emissions from diesel-fueled engines, about 95 percent of which come from diesel-fueled mobile sources, may result in cancer risks that exceed those attributed to other measured TAC. Diesel exhaust is a complex mixture of numerous individual gaseous and particulate compounds emitted from diesel-fueled combustion engines. In August 1998, the CARB identified diesel particulate matter (DPM) as an air toxic. The CARB developed the *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel- Fueled Engines and Vehicles* and *Risk Management Guidance for the Permitting of New Stationary Diesel-Fueled Engines* and approved these documents on September 28, 2000.[1,2] The documents represent proposals to reduce DPM emissions, with the goal of reducing emissions and the associated health risk by 75 percent in 2010 and by 85 percent in 2020. The program aimed to require the use of state-of-the-art catalyzed DPM filters and ultra-low-sulfur diesel fuel.

DPM emissions would occur from construction activities associated with the proposed project. Secondly, TAC emissions would also occur from the CHP and flare operations.

Sensitive receptors are populations that are more susceptible to the effects of air pollution than the population at large, such as the very young, the elderly, and those suffering from certain illnesses or disabilities. Land uses such as schools, children's daycare centers, hospitals, and convalescent homes are considered to be more sensitive than the general public to poor air quality because the population groups associated with these uses have increased susceptibility to respiratory distress. Persons engaged in strenuous work or exercise also have increased sensitivity to poor air quality. Residential areas are considered more sensitive to air quality conditions than commercial and industrial areas, because people generally spend longer periods of time at their residences, resulting in greater exposure to ambient air quality conditions. Recreational uses are also considered sensitive, due to the greater exposure to ambient air quality conditions and because the presence of pollution detracts from the recreational experience. Workers are not considered sensitive receptors because all employers must follow regulations set forth by the Occupation Safety and Health Administration to ensure the health and well-being of their employees.

Construction activities would entail the use of diesel equipment that would generate DPM emissions. Typically, heath risks are estimated based on a chronic exposure period of 70 years. Because exhaust emissions associated with construction activities would be relatively low, short-term in nature, and move throughout the project site (limiting the potential exposure to any receptors); it is not anticipated that exposure to construction-related DPM would result in an elevated health risk. Furthermore, construction emissions are well below the SLO County APCD thresholds of significance for construction activities (see Tables AQ-1 through AQ-3 of the Initial Study). Fugitive dust and combustion emissions would be reduced with the implementation of mitigation measures (See Exhibit B of the Initial Study).

Notably, the proposed CHP unit would be equipped with a Selective catalytic Reduction (SCR) unit with Oxicat to control NOx, CO and ROG emissions, including air toxics such as formaldehyde and benzene that are byproducts of the combustion of gaseous fuels. The SCR with Oxicat would reduce ROG emissions including air toxics such as formaldehyde by up to 90 percent. Additionally, the biogas flare would provide 98 percent destruction efficiency for any toxics present in the biogas. The proposed project would generate small amounts of biogas that, once burned, would generate negligible quantities of air toxics. Given the low emission levels, it is not anticipated that exposure to CHP and flare emissions would result in an elevated health risk.

---

[1] California Air Resources Board. *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles*. October 2000. http://www.arb.ca.gov/diesel/documents/rrpfinal.pdf

[2] California Air Resources Board. *Risk Management Guidance for the Permitting of New Stationary Diesel-Fueled Engines*. October 2000. http://www.arb.ca.gov/diesel/documents/rmgfinal.pdf

SLO County APCD's *CEQA Air Quality Handbook* states that if sensitive receptors are within 1,000 feet of the project site (other air districts such as the Bay Area have a similar criteria), a health risk assessment may be required. The nearest residence is located approximately 1,500 feet to the south and southeast of the project site. The nearest school/daycare is located approximately 2,600 feet to the northeast of the project site. Given the distance from the proposed project and the nearest sensitive receptors, it is not anticipated that exposure to proposed project emissions would result in an elevated health risk. Lastly, given the significant emission reduction control associated with the biogas flare and CHP unit with SCR/Oxicat, exposure to TAC emissions would be expected to be less than significant. Accordingly, health risks at sensitive receptors associated with air toxics emissions from the proposed project would be less than significant.

Response to Comment A-3:

The Air Quality Technical Report (March 29, 2016) referenced in the Initial Study included a comprehensive discussion of potential odors from the project and the project controls to reduce objectionable odors. That report concluded that the potential impact would be less than significant. Key information from that analysis is included below in response to this comment.

Odors are generally regarded as an annoyance rather than a health hazard. The ability to detect odors varies considerably among the population and overall is quite subjective. People may have different reactions to the same odor. An odor that is offensive to one person may be perfectly acceptable to another (e.g., coffee roaster). Odor impacts should be considered for any proposed new odor sources located near existing receptors.

Odor complaints could result in a violation of the SLO County APCD Rule 402 Nuisance. If a project has the potential to cause an odor or other nuisance problem which could impact a considerable number of people, then it may be considered significant. The occurrence and severity of odor impacts depend on the nature, frequency, and intensity of the source; wind speed and direction; and the sensitivity of receptors. Generally, odor emissions are highly dispersive, especially in areas with higher wind speeds. Odors disperse less quickly during inversions or during calm conditions, which hamper vertical mixing and dispersion.

The SLO County APCD *CEQA Air Quality Handbook* contains project screening level distances for nuisance sources, but does not list anaerobic digesters. While some "solid waste" facilities (i.e., transfer station and composting facilities) have screening distances up to one mile, those types of facilities can have major activities that have uncontrolled air quality releases. The proposed anaerobic digester facility is different in that all activities are designed to minimize any uncontrolled air quality releases. The HZI anaerobic digester controls would start with fast-moving doors when vehicles enter and leave, a negative pressure building to seal pre-treatment and post-treatment activity odors inside the building, a fully enclosed digester, and a ventilation system that directs all indoor air to a biofilter for odor treatment before the air is released to the outside environment. The HZI anaerobic digester uses a design that is currently in operation in European locations that are in close proximity to other businesses and residences.

Based on hourly meteorological surface data from the SLO Regional Airport (adjacent and northeast of the project site) from 2009 through 2013, the wind direction is predominately from the northwest with a high frequency of calm and low wind conditions. The regional average annual wind speed is 6.8 mph. Residential receptors are approximately 1,500 feet to the south (downwind) of the project site.

The proposed project would not include any composting operations or storage of liquid digestate in open ponds/lagoons, which have the greatest potential to cause odor issues. The AD process would occur in an enclosed facility. Collection trucks would back into the facility through fast operating roll-up doors and drop organic waste in the receiving area. Organics would be pretreated and then sent to an intermediate storage bunker, where a crane feeds organics into the digester. The AD process occurs in a fully enclosed reactor and the exhaust air from the enclosed facility would be cleaned using a biofilter. The microbes on the media in the biofilter remove odors and after treatment in the biofilter the air disperses to the surrounding environment.

It should be noted that the AD process used is similar to many facilities operated by HZI throughout Europe. Discussion with HZI indicated that the existing plants have not resulted in major odor impacts. In some cases, existing, similar AD facilities are located virtually adjacent (within 200 feet) to residential areas (e.g., Biogas Zürich AG in Zürich, Switzerland).[3] The proposed project would not result in odor impacts to adjacent business owners or downwind residents because the facility is designed to capture and treat odorous air using a biofilter before release into the surrounding environment.

The Permit to Operate for the proposed project would require the applicant to create an Odor Control Plan. Prior to operation of the proposed project, the applicant would develop and implement an Odor Control Plan that identifies potential odor sources and determines control strategies to reduce unexpected odors. Odor control strategies that can be incorporated into these plans may include, but are not limited to, the following:

- Identification and description of the most likely sources of odor;
- A list of odor controls and best management practices that could be implemented to minimize odor releases: These best management practices shall include the establishment of the following criteria:
    - Establish time limit for on-site retention of undigested substrates.
    - Establish contingency plans for operating downtime (e.g., equipment malfunction, power outage).
    - Manage delivery schedule to facilitate prompt handling of highly odorous substrates.
    - Protocol for monitoring and recording odor events.
    - Protocol for reporting and responding to odor events.

All compostable material handling operations and facilities are required to prepare, implement and maintain a site-specific OIMP. The Hitachi Zosen Inova AD facility falls under compost regulations (Title 14, CCR, Division 7, Chapter 3.1 Compostable Materials Handling Operations and Facilities Regulatory Requirements) and would require an

[3] Biogas Zürich AG, http://www.biogaszuerich.ch/de/index.php

OIMP[4]. The OIMP would include the following items in order to provide guidance to on-site operation personnel (as required by Section 17863.4 of Title 14, CCR, Division 7, Chapter 3.1):

> (1) An odor monitoring and data collection protocol for on-site odor sources, which describes the proximity of possible odor receptors and a method for assessing odor impacts at the locations of the possible odor receptors; and,
>
> (2) a description of meteorological conditions effecting migration of odors and/or transport of odor-causing material off-site. Seasonal variations that effect wind velocity and direction shall also be described; and,
>
> (3) a complaint response and recordkeeping protocol; and,
>
> (4) a description of design considerations and/or projected ranges of optimal operation to be employed in minimizing odor, including method and degree of aeration, moisture content of materials, feedstock characteristics, airborne emission production, process water distribution, pad and site drainage and permeability, equipment reliability, personnel training, weather event impacts, utility service interruptions, and site specific concerns as applicable; and,
>
> (5) a description of operating procedures for minimizing odor, including aeration, moisture management, feedstock quality, drainage controls, pad maintenance, wastewater pond controls, storage practices (e.g., storage time and pile geometry), contingency plans (i.e., equipment, water, power, and personnel), biofiltration, and tarping as applicable.

Response to Comment A-4:

Comment noted.

Response to Comment A-5:

The description on page 5 of the Initial Study is correct. As described on page 5, the digester is a completely closed system, as the process operates under anaerobic conditions (i.e., in the absence of air). The biofilter treats the exhaust air coming out of the water treatment and composting halls. To prevent the air from penetrating the environment, both the treatment hall and the composting halls are kept in a state of slight negative pressure. The system is a closed system for air entering the biofilter. The air is then treated by the microbes on the media in the biofilter to remove odors and after treatment in the biofilter the air disperses to the surrounding environment.

[4] Since Section 17863.4 was designed for compost facilities, some of the items would not be needed for the proposed AD project.

References

RCH Group, *Hitachi Zosen Inova Anaerobic Digestion Facility Air Quality Technical Report*, March 29, 2016

RCH Group, *Hitachi Zosen Inova Anaerobic Digestion Plant CHP Unit Engine Emissions*, April 20, 2016

RCH Group, SLO County APCD Comments Regarding HZI AD Plant IS/MND, May 24, 2016

San Luis Obispo County Department of Planning and Building, *Hitachi Zosen Inova Conditional Use Permit Negative Declaration & Notice of Determination*, July 21, 2016

Hitachi Zosen Inova Anaerobic Digestion Plant
DRAFT ODOR IMPACT MINIMIZATION PLAN (OIMP)

Purpose/Context of the OIMP

This Odor Impact Minimization Plan (OIMP) is intended to provide guidance to on-site personnel in the handling, storage, and removal of compostable materials, in accordance with Title 14, California Code of Regulations Section 17863.4. This OIMP will be maintained on-site and revised as necessary to reflect any changes in the design or operation of this site. A copy of any revisions will be provided to the local enforcement agency (LEA) within 30 days of the changes. In addition, this OIMP will be reviewed annually to determine if any revisions are necessary.

Site Operations

The anaerobic digestion (AD) facility will receive residential green waste and residential and commercial food waste. The AD facility will be located at Waste Connections existing service yard (where waste collection trucks start and end each day) at 4388 Old Santa Fe Road. The AD facility will convert organic material into three by-products: biogas, solid digestate and liquid digestate. The AD facility will include Hitachi Zosen Inova's Kompogas Digester, the first of its kind in the United States. The continuously fed, horizontal PF1800 plug-flow digester has a capacity of 1,800 cubic meters at a filling level of approximately 85 percent.

This site will receive 80-90% curbside green waste and 10-20% residential and commercial food waste. The site will take in average of 15 - 100 tons per day of organic material, not to exceed 700 tons per week or 36,400 tons per year. Waste collection trucks enter the facility through automatic fast operating roll-up doors and deposit organic material in the reception/pre-treatment hall. The organic material (feedstock) is fed into the processing area using a wheel loader and is processed within approximately four hours after receipt. The feedstock is shredded and screened to pieces of approximately two-inch size. Contaminants such as plastic and other non-organic items are removed. Ferromagnetic particles are also removed during pre-processing. After being processed, the pre-treated feedstock is transported to an intermediate storage bunker. A crane feeds the pre-treated feedstock to the dosing unit equipped with a conveyor chain. Conveyor belts send the feedstock in batches to the digester.

The AD process is based on anaerobic-thermophillic dry digestion at a temperature of approximately 55°C/ 131°F and a retention time of approximately 14 days. Any unwanted seeds and microorganisms are eliminated inside the gas-tight digester. A slowly turning agitator device results in degasification, while sedimentation of heavy matter in the digestion substrate is addressed due to special positioning of the agitator paddles.

After digestion, the digester remainder material is removed by an outlet pump and dewatered by screw presses, which separates the digested substrate into solid and liquid digestate. The liquid digestate is piped to a liquid digestate collecting tank from where it is treated by advanced mechanical treatment (decanter). A portion is recirculated for moistening the incoming feedstock material. The remaining liquid digestate is pumped to one large liquid digestate storage tank outside the main building (labeled the presswater tank on the Initial Study figures). The storage tank is covered by a gas and odor tight membrane and equipped with a water tight door. Liquid digestate is expected to be loaded into a haul truck at the storage tank by the means of a digestate loading station and transported off-site for agricultural uses.

Solid digestate is taken from underneath the dewatering presses with a shovel loader and deposited into one of several open boxes in the compost hall. The solid digestate is subject to aerobic stabilization and removal of volatile organic compounds. Air is blown for approximately 21 days through the material by means of ventilation channels in the floor, which allow rapid aerobic stabilization. The exhaust air of the boxes, as well as the air of the whole composting hall is to be collected and piped through to the biofilter. Solid digestate is expected to be loaded into a haul truck inside the composting hall and transported off-site for agricultural uses.

Biogas extracted from the digester/gas storage through stainless steel pipes is first fed into a biogas pretreatment/cleaning system. The pre-treated biogas is then used in the combined heat and power (CHP) unit. The CHP unit generates electricity that can be fed to the grid and heat to use for heating the digester.

The digester is a completely closed system, as the process operates under anaerobic conditions. The reception/pre-treatment hall and composting hall are kept in a state of slight negative pressure so that air does not leak outside of the facility. The exhaust air system collects air from the various halls and humidifies the air using water by means of a nozzle system operated with compressed air before sending the air to the biofilter. Reaching humidity levels of 95 percent guarantees optimal operation of the subsequent biofilter, requiring minimal maintenance. To lower the total air volume treated by the biofilter, the exhaust air collected in the reception/pre-treatment hall is reused for aeration of the composting hall before it is led to the biofilter for treatment.

The biofilter consists of a large area with a permeable floor to allow for air flow and is filled completely with pieces of tree roots. Root wood will consist of 70 – 90 percent coniferous (e.g., spruce, fir, pine) and 10 – 30 percent hardwood. After being shredded and sieved to between 40 - 120 mm, the wood chunks offer a large surface as a breeding ground for natural microorganisms which absorb the volatile organic compounds (including the odorous compounds) contained in the exhaust air. The loosely stacked biofilter results in a minimal pressure loss of the exhaust air stream. The exhaust air has a forest floor smell.

I. Section 17863.4 (b) (1) - Odor Monitoring Protocol

A. Proximity of Odor Receptors

The closest receptors will be operations staff and management who will be onsite during operating hours to monitor the compostable materials handling operations.

The closest off-site receptors are industrial/commercial businesses to the southeast, the closest building being 320 feet to the southeast of the reception/pre-treatment hall (where organic waste is initially received). The closest off-site residential receptors are residences approximately 1,800 feet to the south and southeast of the site. The closest daycare, Child Care Resource Connection is approximately 2,600 feet to the northeast of the site. The closest school, Montessori Children's School is approximately 8,000 feet to the west. The only school downwind of the site is over two miles away.

B. Method for Assessing Odor Impacts

Each operating day the operator will evaluate on-site odors and planned operations for potential release of objectionable odors.

If questionable or objectionable on-site odors are detected by site personnel, operations personnel will implement the following protocol:

1. Investigate and determine the likely source of the odor.
2. Assess the effectiveness of available on-site management practices to resolve the odor event and immediately take steps to reduce the odor-generating capacity of on-site material.
3. Determine if the odor traveled off-site by surveying the site perimeter and noting existing wind patterns.
4. If it is determined possible odors impacts have occurred, contact appropriate LEA and/or neighbors.
5. Record the event for further operational review.

II. Section 17863.4 (b) (2) - Meteorological Conditions

A. Wind Velocity

Historical wind data indicates prevailing wind is from the northwest with a high frequency of calm and low wind conditions. The regional average annual wind speed is 6.8 miles per hour. During nights and the winter season a secondary prominence of winds from the southeast and lower wind speeds occur, while during the day and other seasons winds are from the northwest and higher wind speeds occur. See **Attachment 2** for meteorological data.

B. Wind Direction

See **Attachment 2** for meteorological data.

III. Section 17863.4 (b) (3) - Complaint Response Protocol

If and when a complaint is received, designated site personnel will:

1. Obtain time, location, and nature or characteristics of the odor and record that information to review for operational trends.

2. If practical, proceed to the location of the complaint to verify that the site is indeed responsible for the odor. Otherwise, investigate the probable source of the odor complaint and implement operational changes to minimize odors.
3. If warranted, meet with the LEA and complainant (if known and choosing to participate) within a reasonable time frame to discuss the nature of the source of the odor and operational changes proposed and/or implemented.
4. Document the complaint(s) in the Operations/Complaint Log, including the nature of the complaint and actions taken to minimize odors in the future (See the Odor Complaint Response Log provided in **Attachment 1**). Notify the LEA and other interested parties of the status of the complaint.

IV. Section 17863.4 (b) (4) – Design Considerations and Procedures to Minimize Odors

In order to minimize the development of conditions that could lead to odor problems, the compostable material handling areas of the site were designed based on the nature and quantity of materials to be received and stored, climatological factors and adjacent land use.

The primary sources of odors at this site occur during the receipt and initial handling period in the reception/pre-treatment hall before the material is fed into the processing area and after the AD process with the handling of digester remainder material. There are no odors released when the materials are in the Kompogas plug-flow digester because it is a gas-tight closed system. As a result, site personnel assess materials upon receipt for odor generation potential. Site personnel will be trained to manage all compostable material handling in a manner that minimizes the development of conditions that could lead to objectionable odors.

A. Aeration

The solid digestate produced by the digester is subject to aerobic stabilization and removal of volatile organic compounds. Air is blown for approximately 21 days through the material by means of ventilation channels in the floor, which facilitates rapid aerobic stabilization. The exhaust air of the boxes, as well as the air of the whole composting hall is be collected and piped through to the biofilter.

B. Moisture Content of Materials and Moisture Management

The organic material received consists of food waste, which has a high moisture content and green waste, which has a variable moisture content depending upon factors such as weather and material composition. A high moisture content is needed to create anaerobic conditions in the digester and operators can adjust moisture levels in the digester depending on the moisture content of organic materials received.

C. Feedstock Characteristics and Quality

The feedstock consists of curbside green waste and residential and commercial food waste. Incoming materials are checked for physical contaminants and contaminants are removed during pre-processing. Overly contaminated loads may be rejected by operations staff.

D. Airborne Emission Controls

The digester is a completely closed system emitting no odors. Odor emission generating activities would occur in enclosed buildings subject to negative aeration pressure. The exhaust air system collects air inside the enclosed buildings and humidifies the air before sending it to the biofilter for treatment. See the Site Operations discussion above for a more detailed discussion.

E. Process/wastewater Controls

The liquid digestate produced by the digester is piped to a liquid digestate collecting tank from where it is treated by advanced mechanical treatment (decanter). A portion is recirculated for moistening the incoming feedstock material. The remaining liquid digestate is pumped to one large liquid digestate storage tank outside the main building. The storage tank is covered by a gas and odor tight membrane and equipped with a water tight door. Liquid digestate is expected to be loaded into a haul truck at the storage tank by the means of a digestate loading station and transported off-site for agricultural uses.

F. *Material Processing, Handling, and Storage Practices*

1. Processing

a. Feedstock

Feedstock will typically be pre-processed and processed within approximately four hours after receipt and sent to the intermediate storage bunker.

b. Processed Material

Material that has been placed in the intermediate storage bunker after processing will usually be fed to the anaerobic digester within approximately 24 hours. The intermediate storage bunker is a sealed structure so organic material could be stored in the intermediate storage bunker for greater than 24 hours (Title 14, Chapter 3.2, Article 6, Section 17896.57).

G. *Weather Event Impacts*

Since organic material handling operations occur inside the enclosed facility and exhaust air is treated with a biofilter, it is unlikely that weather events will cause any significant odor events. Odor emissions are highly dispersive during high-wind speed conditions. During a weather event such as an inversion, operations staff will survey odors on- and off-site.

H. *Contingency Plans*

1. Fire Prevention

The risk of fire hazard at the AD facility is low because of the tightly controlled internal environment within the digester itself. The AD facility and biogas transmission lines will operate with very low pressures, similar to natural gas distribution lines, minimizing high pressure conditions. The AD facility will include redundant fire safety relief valves to prevent over pressurizing, flame arresters, gas detectors, and physical barriers to minimize fire hazards. The AD facility will meet all fire and life safety requirements of the California Fire Code and will have a final Fire Safety Plan approved before building occupancy.

2. Water Supply

The AD facility will obtain its water needs from an on-site well. The well is used primarily during project start-up and once the facility is fully operational the main water needs are fulfilled by internal circulation. Well-water will be used for cleaning and limited process purposes. The Waste Connections property has an independent fire pump connected to a shared 200,000 gallon fire water tank on an adjacent property to the east.

3. Equipment

The biogas flare would be used to burn biogas in case of an emergency.

4. Power

The facility can run completely autonomously from PG&E and power itself. The facility uses approximately 23 percent of the electricity it generates and then balances the rest back to PG&E. The AD facility is tied to PG&E and can switch gear to PG&E electricity at any time. A short-term backup power supply will be available to power the control system of the facility under a power outage.

5. Personnel

The facility operator will work closely with management and staff to operate the AD facility. All operational components will be understood by all parties involved so that on-site personnel will understand how to operate the facility and respond to problems, odor and non-odor related.

I. *Personnel Training*

Personnel will be trained in the proper use of facility equipment. Potential hazards and safety features will be stressed as well as handling procedures to minimize the production of odors. No employee will be permitted to operate equipment until the employee has demonstrated that he or she is competent to operate that equipment. Annual review and training will ensure continued safe operations of the facility and compliance with regulations will be conducted.

J. *Biofiltration*

The biofilter will be a large open area with a permeable floor to allow for air flow and is filled completely with pieces of tree roots. Root wood will consist of 70 – 90 percent coniferous (e.g., spruce, fir, pine) and 10 – 30 percent hardwood. After being shredded and sieved to between 40 - 120 mm, the wood chunks offer a large surface as a breeding ground for natural microorganisms which absorb the volatile organic compounds contained in the exhaust air. The loosely stacked biofilter results in a minimal pressure loss of the exhaust air stream. The exhaust air has a forest floor smell.

K. *Load Enclosure*

Incoming organic waste loads will be enclosed with the collection trucks. Once organic waste is delivered, all operations take place inside the enclosed facility.

V. Section 17863.4 (b) (5) – Operation Considerations and Procedures to Minimize Odors

In order to minimize the development of conditions that could lead to odor problems, the AD facility will include the following operational procedures:

A. Survey

Each operating day the operator/site personnel will evaluate on-site odors and planned operations for potential release of objectionable odors. If questionable or objectionable on-site odors are detected by site personnel, operations personnel will implement the Odor Monitoring Protocol in this OIMP.

B. Biofilter

Each operating day the operator/site personnel will investigate air exiting the biofilter to ensure its efficient operation. Air exiting the biofilter should not contain in process odors. If process odors are present in the air exiting the biofilter the operator/site personnel will make the necessary adjustments such as adjusting the humidity, pressure and/or modifying air changes in the facility.

C. Sanitation

Each operating day the operator/site personnel will survey the reception/pre-treatment hall and processing areas looking for any organic waste material or liquid on the floor or walls of the AD facility. Any organic waste material or liquid will be removed and the area will be cleaned.

D. Doors

All doors will only be opened for a minimal amount of time. Automatic fast-operating doors in the reception/pre-treatment hall and composting hall will only open and close when collection or hauling trucks or operational vehicles (e.g. wheel loader) are entering/exiting the facility.

E. Processing

Organic material is pre-processed and processed within approximately four hours after receipt and sent to the intermediated storage bunker.

F. Aeration

Solid digestate is placed in boxes in the compost hall and the solid digestate is rotated from box-to-box every three days to increase the surface area exposed to air. Air is blown for approximately 21 days through the solid digestate by means of ventilation channels in the floor, which facilitates rapid aerobic stabilization.

VI. Section 17863.4 (d) – Annual Review of the OIMP

The OIMP will be reviewed annually by the operator and revised as necessary.

A copy of this OIMP will be kept at the facility's administrative office. The OIMP will be revised within 30 days to reflect significant changes to operations that affect the OIMP, with a copy provided to the LEA, when appropriate.

Today's date: ____/____/____

Attachment 1

Control No. ____-_____-____

(year-juris.-#)

ODOR COMPLAINT RESPONSE LOG

Complaint Received From: ____

Name of Complainant: ____

Address: ____

City: ________________________ Zip code: __________________

Phone number: (______) ________________________

Facility/Operation Name: ____

SWIS# (if applicable): _____-_____ -_________

Facility Address: ____

City: ________________________ Zip code: __________________

Date Complaint Received (if applicable): _____/______/_____

Date(s) and Time(s) Alleged Odors Detected: ____/____/____ ___:___AM/PM

Detected by: ____

Description of Alleged Odor(s) and/or Attachments__________________________________

____

____

Name of LEA Representative Contacted (if applicable) _______________________________

Date/time LEA Notified: ____/____/____ ___:___AM/PM

Inspection performed by LEA? ______ Other Agencies Present at Inspection? ___________

____

Inspection Resolution/Results (include date) _______________________________________

Follow-up:

To Complainant? ____

To Other Agencies? ____

Form Completed By: ____

Signature: ____ Date: ____/____/____

Attach Copy of Complaints or Referral From Other Agencies.

Air quality is a function of both the rate and location of pollutant emissions under the influence of meteorological conditions and topographic features affecting pollutant movement and dispersal. Atmospheric conditions such as wind speed, wind direction, atmospheric stability, and air temperature gradients interact with the physical features of the landscape to determine the movement and dispersal of air pollutants, and consequently affect air quality.

Hourly meteorological data from San Luis Obispo Regional Airport (surface data), located adjacent and northeast of the project site, from 2009 through 2013 were examined. **Figure 1** displays the wind rose during this period. Wind directions are predominately from the northwest with a high frequency of calm and low wind conditions, as shown in **Figure 2**. The regional average annual wind speed is 6.8 miles per hour.

FIGURE 1

WINDROSE FOR SAN LUIS OBISPO REGIONAL AIRPORT

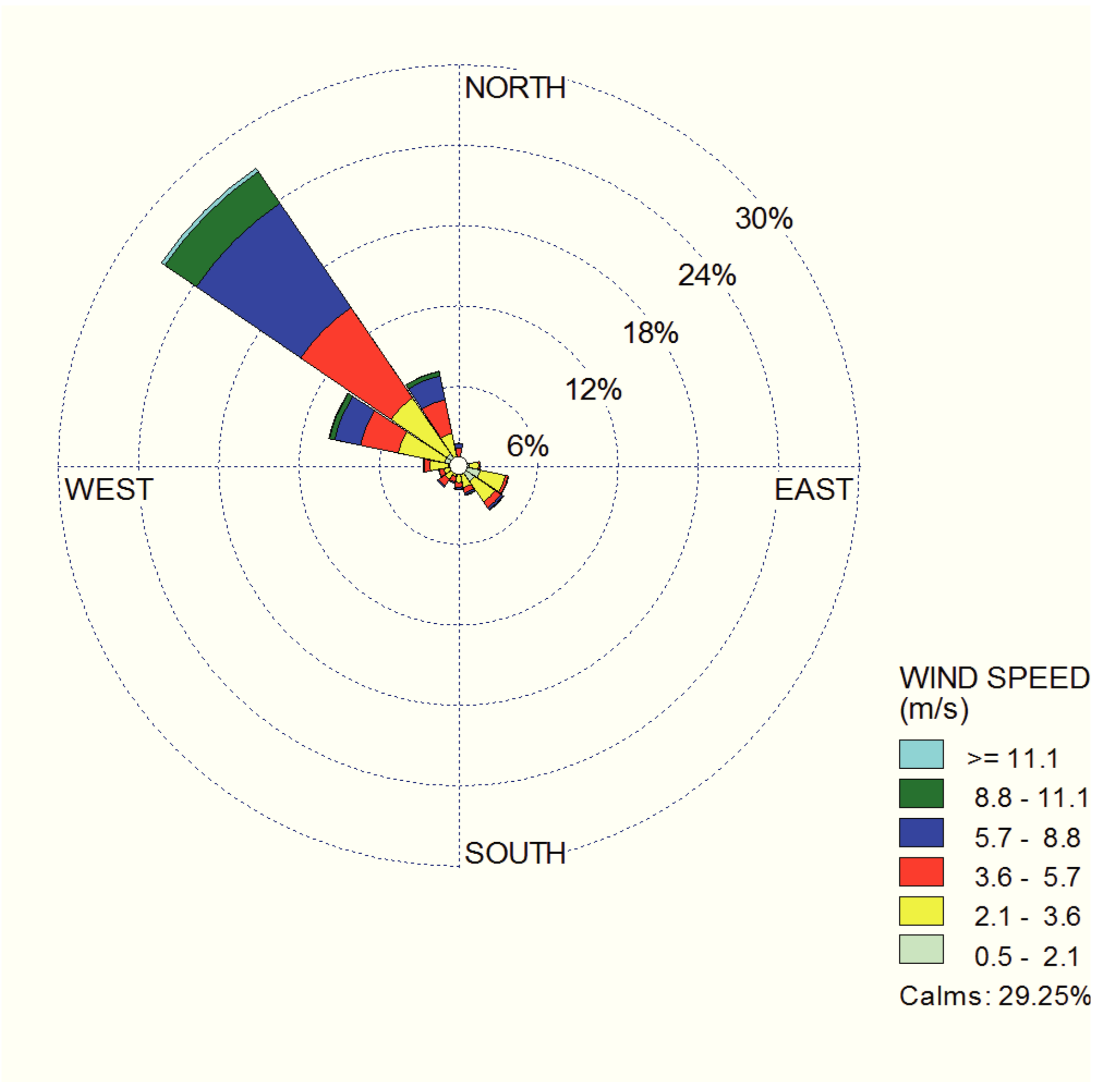
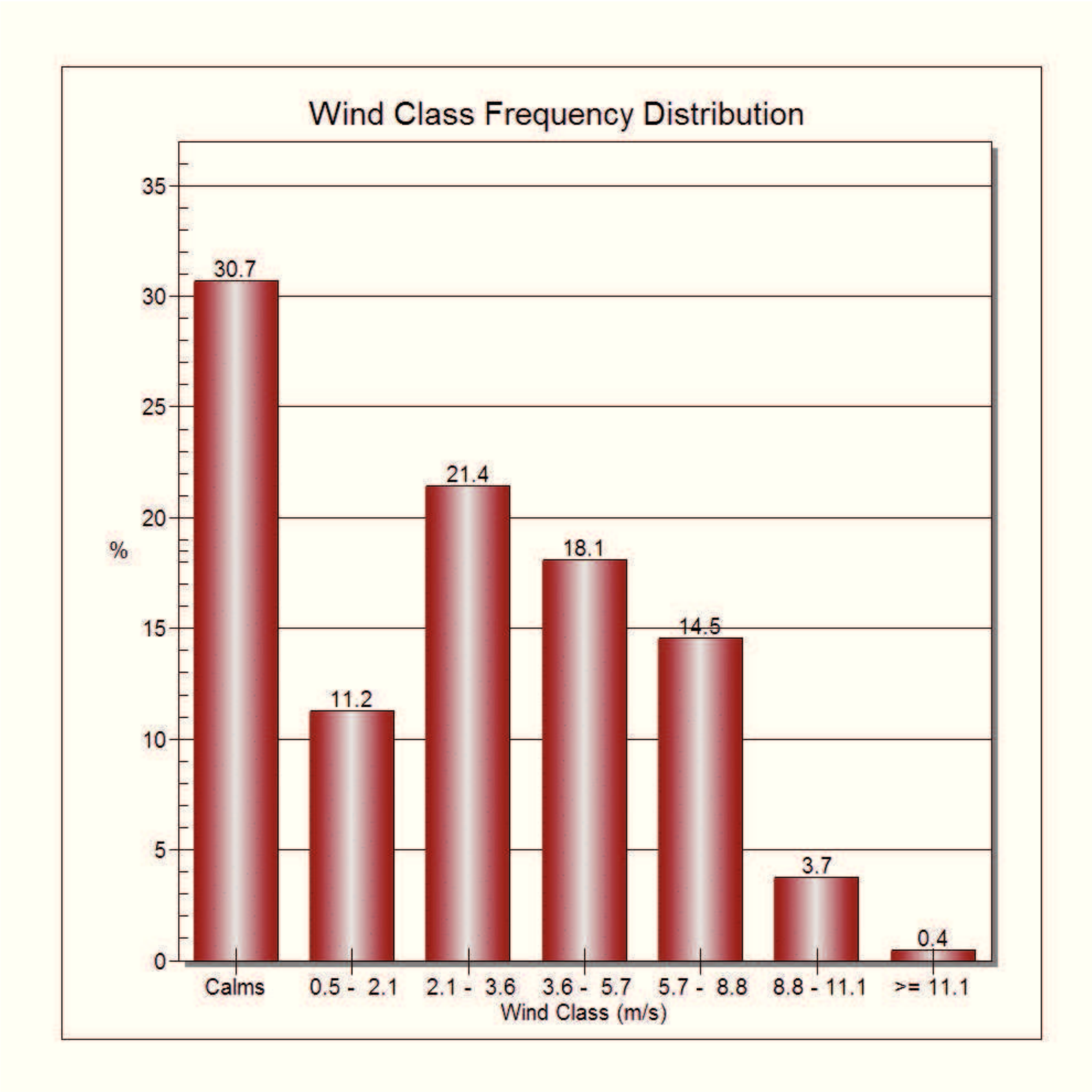


FIGURE 2

WIND SPEED DISTRIBUTION FOR SAN LUIS OBISPO REGIONAL AIRPORT



October 11, 2016

C.M. Florence, Principal Planner
Oasis Associates, Inc.

San Luis Obispo, California

Ms. Florence:

This letter summarizes our peer review of the transportation analysis conducted for the Mitigated Negative Declaration (MND) prepared by County staff for the proposed Anaerobic Digestion Plant (ADP) at the Waste Connections (WC) facility located on Santa Fe Road in unincorporated San Luis Obispo County.

BACKGROUND

The project consists of construction of an ADP to process green waste. WC currently collects green waste throughout the County and disposes of it off-site. Upon construction of the ADP green waste would be processed by the ADP, which will change truck patterns as described in the trip generation section below. In addition, two new trucks would be added to collect commercial food waste. Operations for standard waste and recycling services would not be changed as a part of the project and are therefore not discussed herein.

TRIP GENERATION

The proposed project does not conform to typical land use types for which reliable survey data is available, such as data provided in the Institute of Transportation Engineers' *Trip Generation Manual*. Trip generation was therefore estimated based on the project description and in consultation with WC staff.

Current Operations

WC currently collects green waste in three primary service areas, described below.

- Four trucks collect green waste in the South County. Each truck departs the WC facility in the morning, collects green waste, unloads green waste off site (typically at the Engle & Grey facility in Santa Maria), collects green waste, unloads off-site, then returns to the WC facility in the afternoon.
- Two trucks collect green waste in San Luis Obispo, departing WC in the morning, collecting and disposing the waste twice at an off-site location before returning empty to WC in the afternoon.
- Three trucks collect green waste in the North County, departing WC in the morning, collecting and disposing waste at an off-site location, then returning empty to WC in the afternoon.

Proposed Operations

Once operational the ADP will change travel patterns in three ways:

1) The green waste will be unloaded on the WC site instead of at the off-site locations. While this will reduce regional trips because the final unloading would occur at the same location where the trucks are stored, it will increase the trips to and from the WC site.

2) Two new trucks will be added to collect commercial green waste.

3) Additional employees will travel to the site to staff the new commercial green waste trucks and operate the ADP.

Table 1 summarizes the net new trips generated by the proposed project. The nine existing green waste trucks would now unload at the WC site. The South County and San Luis Obispo routes would unload mid-day at the WC site, collect additional waste, then unload again before storage in the afternoon. This corresponds to twelve additional truck trips. The North County routes would unload once at the end of the day before storing the trucks for the night, resulting in no additional trips compared to current operations.

Table 1: Project Trip Generation

	Daily Trips To/From WC Site
Current Operations	
9 Green Waste Trucks[1]	18
Proposed Operations	
9 Green Waste Trucks[2]	30
2 New Commercial Green Waste Trucks[3]	8
4 New Employee Truck Drivers	8
3 ADP Operations Employees[4]	8
Proposed Operations Subtotal	*54*
Total New Daily Trips	**36**

1. Nine existing trucks depart WC site in the morning and return in the afternoon.
2. The nine existing trucks will modify their routes to unload at the WC facility. This results in two additional trips to WC for each truck on the South County and SLO routes (6 trucks X 2 additional trips=12 additional trips).
3. Commercial green waste trucks would unload once mid-day then again at the end of the day.
4. Assumes 1/3 of on-site employees eat lunch off site.

Source: Waste Connections Staff, CCTC, 2016.

The new commercial green waste trucks would depart in the morning, collect green waste, return mid-day to unload, collect green waste, then unload on site and be stored for the night. Each commercial green waste truck was assumed to be operated by two drivers.

Three new employees would operate the ADP. Based on information provided by WC staff approximately 1/3 of on-site employees typically leave the site for lunch. Table 1 shows that the project would generate 36 additional daily vehicle trips. Most, if not all, of these trips would occur outside of the typical weekday 7:00-9:00 AM and 4:00-6:00 PM peak periods. WC employees typically arrive for work between 5:30-6:00 AM and leave between 2:00-4:00 PM.

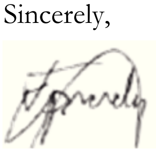
CONCLUSIONS

The City of San Luis Obispo's *Transportation Impact Study Guidelines* require study when a project would generate over 100 peak hour vehicle trips. The proposed project would not require a Transportation Impact Study (TIS) according to these guidelines. The County of San Luis Obispo does not have a specific trip threshold triggering a TIS, but past experience shows that a project of this size typically would not require additional study of traffic impacts due to the very low peak hour trip generation rates.

In conclusion, we find that potential impacts of the ADP are adequately described. The additional vehicle trips are insignificant and would not impact transportation facilities. We concur with the findings and supporting analysis in the MND.

Please let me know if you have any questions.

Sincerely,



Joe Fernandez, PE, AICP
Principal